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Investigation of geometric characteristics of the titanium alloy surface subjected to magnetic-impulse processing by means of SPM

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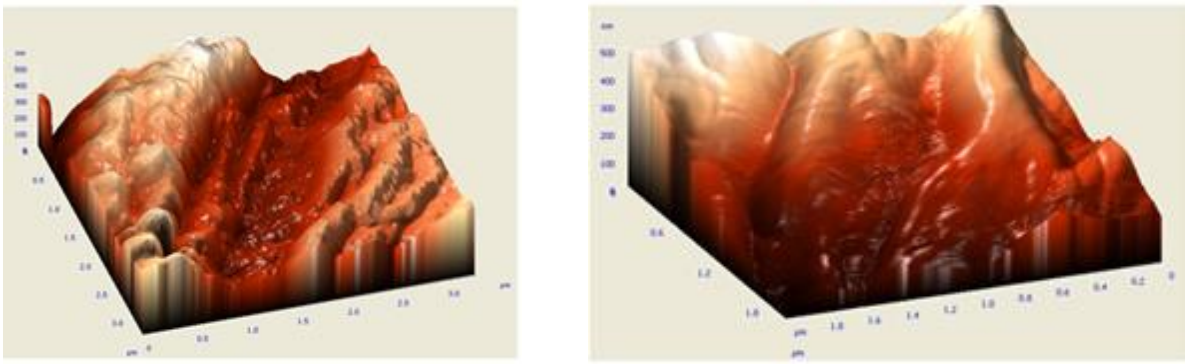
With the development of nanotechnology, obtaining surface properties by coating and improving the properties of the surface layer becomes essential. However, it is important to move from property research to the measurement of the geometric parameters of the surface, taking into account the traceability of measurements of linear dimensions in the nanometer range [1].

In addition, when switching to submicron and nanometer ranges, special attention should be paid to both environmental parameters and measurement techniques. One example is the measurement of roughness parameters of the surfaces using scanning probe atomic force microscope. The paper presents the study of the surface properties of titanium alloy products after magnetic-pulse processing (m & e).

It is established that the use of m & e provides smoothing of the surface of small micronutrients of parts. The detected effect of roughness reduction is associated with the melting of micro-steps and facilitation of micro-deformation of the surface layer, as well as due to the impact on the metal of the main and reflected shock waves, which leads to microplastic deformation on the surface. [2]. The reduced surface roughness RA was reduced from 0.125 μm (reference sample) to 0.032 μm (reference sample after MIO) [3].

It is also essential that, from the metrological point of view, the area of measurement of the obtained surface characteristics is at the level of 12-14 purity class, which in turn meets the requirements of measuring the effective surface roughness height in the submicron range using SPM. The results of the analysis of the profiles obtained by scanning probe microscope Solver P - 47 show that the measured altitude values of the roughness correspond to the size of the scanning area 256x256 points (3x3 microns) reduced roughness values at 0.03-0.05 microns.

Figure 1 shows an example of the surface obtained with the Solver p-47 SPM.



(a) (b)

Figure 1. (a) Initial sample; (b) Sample after MIO.

The paper deals with the practical application of the method of magnetic-impulse processing in order to improve the surface properties of titanium alloys on the example of VT23, the methods of evaluation and elimination of measurement errors in order to implement measures of metrological support in production conditions in the interests of industry on the example of practical application of scanning probe microscopy [4].

1. K. Gogolinsky et al., *Nanoindustry* **1**, 48 (2012).
2. V. Konshin, A.S. Pomelnikova et al., *Technology of metals* **1**, 22 (2013).
3. A.V. Komshin, A.S. Pomelnikova, N. Nochovnaya, *Metallography and heat treatment of metals* **6**, 50 (2015).
4. A.S. Komshin, A.B. Siritzky, *Nanoengineering* **4**, 14 (2014).